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BIDENS AUREA (ASTERACEAE: HELIANTHEAE): ADVENTIVE CYTOTYPES IN ARGENTINA

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ABSTRACT

Bidens aurea (**Asteraceae:Heliantheae**): Adventive cytotypes in Argentina. – Cytotypes belonging to *Bidens aurea* (Aiton) Sherff are described for the first time for the Buenos Aires province, Argentina. The cytotypes have 60 or 66 chromosomes in somatic cells with aneuploid changes in several cases, $2n = 67$ and $2n = 68$. The chromosome count of $2n = 66$ was confirmed by meiotic analysis ($n = 33$). Morphological traits and the potential weediness of this species are discussed.

KEY WORDS: Asteraceae, Heliantheae, *Bidens*, Argentina, cytology

INTRODUCTION

Bidens L. (Asteraceae: tribe Heliantheae) is a large and widespread genus. It contains over 240 species (Sherff 1937; Crowe & Parker 1981). In Argentina it contains ten species, of which three are extensively distributed throughout the Buenos Aires province (Cabrera 1963). These are *B. laevis* Britton, Sterne, & Poppens; *B. pilosa* L., and *B. subalternans* De Candolle.

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Bidens comprises different chromosome numbers, from $n = 10$ through $n = 73 \pm 3$, 4 (Waisman *et al.* 1986). Covas & Schnack (1946) found $x = 6$, although for other authors the genus has several basic numbers: $x = 10$, 11, 12, 14, and 18 (Turner & Flyr 1966) where $x = 12$ would be the basic modal number with several aneuploids (Solbrig *et al.* 1972; Keil & Stuessy 1977).

The three taxa already mentioned for Buenos Aires province, grow in disturbed lands. Two of these are annuals and grow well in developed soils, while *Bidens laevis* grows in wet conditions and can be annual or perennial. Only *B. pilosa* is a weed of wide distribution all over the world (Bayer Agrochem. Div. 1983).

In this paper we describe for the first time several populations of *Bidens aurea* with weed characteristics.

MATERIALS AND METHODS

Eight populations of *Bidens aurea* from Buenos Aires province (*962, 963, 969, 972, 973, 977, 978*, and *983*) were analyzed. Plants of each locality were grown in clay pots. Voucher specimens were deposited in the herbaria at Balcarce (BAL) and Buenos Aires (SI). For the proper determination of the plant material, morphological measurements of ten individuals of each population were made. The origin and chromosome counts of the examined material are listed in Table 1.

We determined chromosome numbers from root tips using the technique of Núñez *et al.* (1974). The meiotic count of *962* was made by squashing anthers, which previously had been fixed in alcohol:acetic acid (3:1), in acetic acid (45%), and staining them by following Snow's technique (Snow 1963).

A Wild M-20 standard microscope was used for photographs. Pollen fertility was estimated following Alexander (1969).

To estimate the importance of vegetative regeneration, rhizomes of equal weight were sown in clay pots (30 cm diameter) registering the dry weight (DW) of shoot and root modules at the end of a two month growing period.

RESULTS AND DISCUSSION

Description: *Bidens aurea* (Aiton) Sherff, Bot. Gaz. 59:313. 1915.

Common name: Tea herb (Hierba del Té).

Phenology: This species begins to grow in October. It flowers mainly from April to May. Achenes ripen thirty days after ligule expansion.

Studied material:

ARGENTINA. Buenos Aires province: Partido de Gral. Balcarce, waste lands, gardens, country routes, orchards, 29-III-1989 (fl,fr), *Montes & Cerono*

Table 1: Chromosome numbers reported for *Bidens aurea*.

Collection	Source	*n*	2*n*	Reference
B. cf. *aurea*	Michoacán	24		Powell & Turner 1963
B. aurea			72	Tutin 1976
B. aurea		23, ca. 35		McVaugh 1984
B. aurea 962	Balcarce	33	66	(1)
B. aurea 963	Balcarce		60	(1)
B. aurea 969	M. d. Plata		66-67	(1)
B. aurea 972	M. d. Plata		60	(1)
B. aurea 973	M. d. Plata		60-66-68	(1)
B. aurea 977	M. d. Plata		60-67-68	(1)
B. aurea 978	Pergamino		60-66-68	(1)
B. aurea 983	M. d. Plata		60, ca. 66	(1)

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962, 963, 976 (BAL), *965, 966* (SI); Partido de Gral. Pueyrredón, provincial route 226, km 10, 3-V-1989 (fl), *Montes & Cerono 972* (SI); Mar del Plata, ruderal, 15-IV-1989 (fl,fr), *Montes & Cerono 969, 973* (BAL), *977* (LP), *971, 972, 983* (SI); Partido de Pergamino, Pergamino, ruderal, 20-II-1990 (fl), *Montes & Cerono 978* (BAL).

URUGUAY. Dto. Montevideo: Montevideo, in vacant sites, 6-IV-1979 (fl,est), *Brescia & Marchesi 16106* (SI).

MEXICO. Hidalgo: Tlalnalapa, 2,400 a.s.l., 15-X-1978 (fr,fr. est), *Fernández 15* (SI).

Distribution, habitat, and vegetative propagation:

This species can be found in U.S.A. (Arizona), México, and Guatemala (McVaugh 1984). It grows in wet meadows, swamps, humid slopes in open forests, corn fields, and other crops. It is possible to find it in southeastern Europe (Tutin 1976) and Chile, where it has established in orchards, vineyards, and corn fields (Kogan 1983). It has been found in Montevideo (SI 16106), Uruguay. We have found it in a wide area of Buenos Aires province, growing in wet or dry conditions, in highly fertile soils, being an invader of gardens and orchards.

These populations established in the area about fifteen years ago. They were first cultivated for their colorful flowers (white and yellow ligules).

This rhizomatous perennial is capable of active vegetative propagation (Figure 1). During 60 days (February-March) pieces of rhizomes about 4 cm long, with two nodes, developed plants of 40 cm height with leaves of 13 cm long $\times$ 3 cm wide.

Relationship between DW of rhizomes and DW of shoots was 2:1 (rhizomes 6.5 gr $\pm$ 0.5; shoots 3.0 gr $\pm$ 0.4; $N = 10$) in two months of growth.

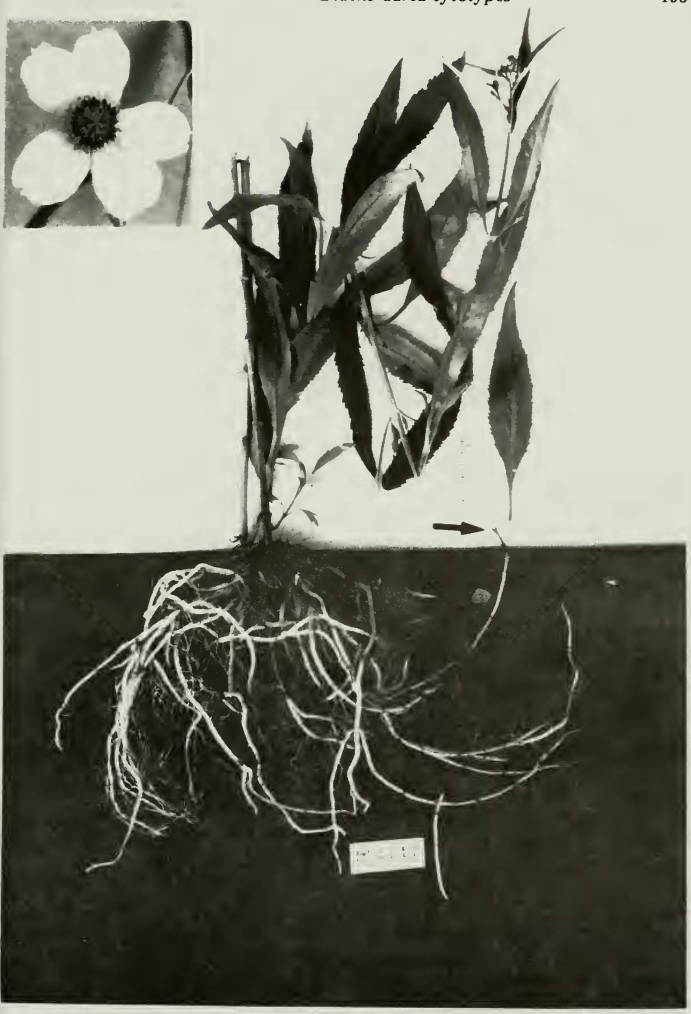

Figure 1. *Bidens aurea* cultivated specimen (*963*). Arrow indicates a sprout arising from the tip of a rhizome. The inset shows an open capitulum, × 0.5.

Figure 2. *Bidens aurea* meiosis showing anaphase I chromosomes (*962*), n = 33, × 4,000.

Cytological analysis and fertility:

Table 1 shows different chromosome counts from several populations of Buenos Aires province as well as counts on the same species made by other authors.

We found adventive populations of *Bidens aurea* with a somatic complement of 60, 66, 67, and 68 chromosomes. The gametic complement of $2n = 66$ was analyzed at anaphase I (Figure 2).

Covas & Schnack (1946) reported $x = 6$ for the genus, however, other authors cited multibasic counts, $x = 10$, 11, 12, 14, 17, and 18, where the most probable number would be $x = 12$ (Turner & Flyr 1966; Solbrig *et al.* 1972; Keil & Stuessy 1977).

Up to now, it is not possible to assure what would be the basic number for *Bidens aurea*. The cytotype $2n = 60$ could be decaploid ($2n = 10x = 60$ with $2n = 11x = 66$) or pentaploid ($2n = 5x = 60$) both with several aneuploid cytotypes ($2n = 67$, 68). One of these hypotheses needs to be confirmed.

The chomosome counts cited for another species of the genus indicated a considerable heteroploidy (Turner & Flyr 1966). Our counts are complementary to those found by other authors in *Bidens aurea*. Powell & Turner (1963) indicated $n = 24$; Tutin (1976) $2n = 72$, and later, McVaugh (1984) $n = 23$ and n = ca. 35. These results are similar to those obtained with another species of *Bidens*, e.g., *B. pilosa* with $n = 12$, 14, 24, 36, and 38 (Turner & Flyr 1966),

which supports the suggestion that polyploidization is an active mechanism in the evolution of several species within the genus.

Pollen from several plants averaged 76% stainability, though the adventive populations produced a low proportion of viable achenes (0 = none, up to 10 fertile achenes per capitulum, $\bar{x} = 3$, s.d. $\pm$ 2.4; $N = 40$). The achene germination varied between 10% and 50%. This confirms the results of other authors for populations growing in Italy (Sherff 1937) and Chile (Kogan 1983).

Although the main form of local propagation seems to be the rhizomatous system, the colonization of different areas within Buenos Aires province suggest that, at least, the achenes play a relatively important role in the geographic propagation of the species.

The different cytotypes of *Bidens aurea* found in Argentina, linked with the invasive characteristics of these plants, as shown by the vigorous growth of the rhizomatous system, makes it important to control the invasion of new areas, given that this species resumes the characteristics of a dangerous weed.

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